

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The recent discussion on the proposed new buildings for anatomy and physiology disclosed that the Financial Board do not consider that the whole plan can be proceeded with at present. They hold that only £10,000 is available; but this is because it is proposed to diminish the annual contributions from the Colleges for some years. It appeared to be agreed that the lecture-room or middle block could be best dispensed with if absolutely necessary, the blocks of physiological and anatomical class-rooms and dissecting-rooms being most essential. Prof. Foster mentioned that the labour of conducting the practical classes in physiology was so great as to leave no time for research, and to strain the health of himself and his demonstrators almost to the point of breaking down. The present buildings not only limited but spoiled their work.

The adjudicators of the Hopkins Prize in connection with the Philosophical Society have recommended that it be awarded to Sir William Thomson for his mathematical researches upon the theory of the tides, and other important investigations in mathematical physics.

The General Board of Studies has issued a report deprecating the proposed diminution of College contributions, and showing that that proposal will destroy any chance of appointing new teachers, or increasing the small stipends now paid to University lecturers and readers, or of making any payments in aid of research. A great number of detailed needs for all the departments are specified, the scientific Boards being well represented. The Reader in Botany and the Lecturer in Animal Morphology and others are strongly recommended for immediate increase, and a capital expenditure of £30,000 is needed for museums, laboratories, lecture-rooms, &c.

The following is the subject for the Adams Prize to be adjudged in 1891:—The motion of a satellite about a spheroidal planet, and the reaction on the planet. The ordinary approximation is supposed to be inadequate, either because the ellipticity of the planet is too great, and the distance of the satellite too small, or because the obliquity of the orbit is too great. It is also desired that the influence of a distant disturbing body (such as the sun) may be taken into account in so far as is found practicable. The successful candidate will receive about £170, but is required to print the essay at his own expense.

The report on the local examinations of last December states that in chemistry the answers were on the whole satisfactory, but chemical calculations were in general inaccurately performed. In heat, the juniors answered badly, the senior boys better, but many of the senior girls were quite ignorant of the subject. In statics, dynamics, and hydrostatics, the juniors had not grasped the elementary ideas, while the seniors did better, except in the arithmetic of calculations. The answers seem to show that these physical subjects are not suitable for juniors. In electricity and magnetism, taken only by seniors, the boys did well. The botanical answers varied greatly at different centres, and questions on flowering plants were much better answered than those on cryptogams. In zoology the elements were known, but many answers were very wordy and irrelevant. Several seniors described the structure of a Vorticella rather well, but also named and described the mouth-appendages of a crayfish (the specimen being before them) likewise as a Vorticella.

SCIENTIFIC SERIALS.

American Journal of Science, March.—Some determinations of the energy of the light from incandescent lamps, by Ernest Merritt. Two series of experiments are described, which have been carried out for the purpose of determining what portion of the energy supplied to a lamp is given off as light, and what proportion is wasted practically as dark heat. In the first, based on Melloni's calorimetric method, the light is separated from the dark heat by passing the radiations to be measured through a thin layer of water, or, better still, through a solution of alum in water. The energy of the dark heat, which is almost entirely absorbed, is then measured by the rise in temperature of the water, and that of the light by a thermopile. In the second process the calorimeter was abandoned, and a cell, 1 decimetre thick, containing a strong solution of alum, was used for absorbing the dark heat. The light, after passing through this cell, was allowed to fall on a thermopile, and the deflection

was observed. Then the alum cell was removed, and the deflection corresponding to total radiation was observed, the ratio of the two deflections giving the ratio of the light energy to the total energy. This being determined by electrical measurements, the energy of the light could be calculated.—On the ophiolite of Thurman, Warren County, New York, with remarks on the *Eozoon canadense*, by George P. Merrill. This ophiolite, a kind of verdantique marble, is found to be an alteration, or metasomatic product after a mineral of the pyroxene group. Its constitution promises to throw some light on the Eozoon problem.—On the origin of the deep troughs of the oceanic depression; are any of volcanic origin?, by James D. Dana. A general survey of the oceanic regions leads to the inference that volcanic action can only have had a very subordinate part in determining the origin and position of the great marine depressions. Their source must be sought still less in superficial causes, such as erosion, but rather in the interior agencies of primordial development. The paper is accompanied by a bathymetric map of the Pacific and Atlantic, based on the recent charts of the British and United States Hydrographic Departments.—Description of a problematical organism from the Devonian, at the Falls of the Ohio, by F. H. Knowlton. These puzzling organisms, here provisionally named *Calcisphaera lewami*, from the collector, have been submitted to various American and European palaeontologists, and the evidence both for and against the view that they are a fruit of Chara, is given in detail.—Papers are contributed by George H. Williams, on the geology of the Island of Fernando de Noronha (part 2, petrography); by S. L. Penfield, on some curiously developed pyrite crystals from French Creek, Delaware County, Pennsylvania, and on some crystallized bertrandites from Maine and Colorado; and by J. S. Diller and J. E. Whitfield, on dumortierite from New York and Arizona, peridotite from Kentucky, and gehlenite occurring in furnace slag in Pennsylvania.

THE *Memoirs of the Novorossian (Odessa) Society of Naturalists*, vol. xiii. fasc. 1, contain a series of papers on the late L. Cienkowski, by P. Boutchinsky, W. Zalsensky, L. Richavi, G. Sadkowsky, and S. Karwatzky, being full reviews of the late Professor's extensive scientific work, and giving a full bibliography of his contributions to science.—The next papers of importance are: on the rainfalls in South-Western Russia, by A. Klossovsky; on the copulation of the nuclei of cells during the sexual processes of Fungi, and on the absorption of water by the overground parts of plants, by W. Chmielevsky; on the Jurassic beds of Orenburg and Samara, by I. Sintsoff, being revised lists of fossils found in various parts of these provinces; on the action of methylene-iodide upon the ether of malonic acid, by S. Tanatar; and on the influence of the medium, and especially of temperature, upon *Planorbis vertia*, by Mary Balashova.

SOCIETIES AND ACADEMIES.
LONDON.

Royal Society, March 7.—“On the Cranial Nerves of Elasmobranch Fishes. Preliminary Communication.” By J. C. Ewart, M.D., Regius Professor of Natural History, University of Edinburgh. Communicated by Prof. Burdon Sanderson, F.R.S.

This paper contains a short account of the cranial nerves of *Lamargus microcephalus* and of *Raia batis*, and it is especially shown that in connection with the roots of the trigeminal and facial nerves there are altogether five large ganglia—one of them apparently representing two ganglia—and that in connection with the vagus there are three separate ganglia in *Lamargus* and six in *Raia*. It is further pointed out that the nerve to the lateral line arises by a special root quite distinct from the rest of the vagus complex, and that it is provided with a separate ganglion, and also that the mucous canals of the head and trunk, together with the numerous ampullæ of the sensory tubes, are either supplied by nerves belonging to what is termed the facial complex or the lateralis division of the vagus complex.

Attention is especially directed in *Lamargus* to the following facts: (1) that the ganglion of the ophthalmicus profundus lies only very slightly in front of the ganglion (Gasserian) of the trigeminal; (2) that there is no connection between the oculo-motor nerve and the ophthalmicus profundus ganglion; (3) that the ciliary nerves spring from the trunk of the ophthalmicus profundus some distance in front of its ganglion; (4) that neither in

any part of the trunk or main branches of the oculo-motor nerve nor in connection with the branches which pass from the oculo-motor to join the ciliary branches of the ophthalmicus profundus are there any ganglionic cells; (5) that the so-called facial consists of four separate nerves, the ophthalmicus superficialis, buccal, palatine, and hyomandibular—the last receiving a special bundle of fibres while still in the cranial cavity from the ophthalmicus superficialis; (6) that there are numerous ganglionic cells at the base of the palatine nerve—the nerve which is said to correspond to the great petrosal nerve of higher Vertebrates; and (7) that the lateralis nerve supplies the aural mucous canal as well as the canal of the lateral line.

In Raia the following points are brought out, viz., (1) that the ganglion of the ophthalmicus profundus, which is some distance in front of the Gasserian ganglion, lies over the deep branch of the oculo-motor nerve, from which minute branches pass under the ophthalmicus profundus ganglion to join two or more of the ciliary branches of the profundus; (2) that the ciliary branches usually arise from the under surface or outer edge of the ganglion of the ophthalmicus profundus, none of them except on rare occasions springing as in *Læmargus* from the trunk in front of the ganglion; (3) that were the root and trunk of the ophthalmicus profundus greatly reduced in size an arrangement similar to that which exists in the higher Vertebrates would be produced, and the ganglion of the ophthalmicus profundus would appear to especially belong, as has often been taken for granted, to the oculo-motor nerve; (4) that the nerve, generally stated to correspond to the chorda tympani of higher Vertebrates, consists chiefly of fibres which spring from the large ganglion at the base of the hyomandibular nerve; (5) that the ganglion of the lateralis lies several inches (three or four) from the origin of the nerve, and that in addition to supplying the canal of the lateral line the lateralis supplies the dorsal pleural mucous canal, the aural canal, and part of the occipital; (6) that the five additional ganglia of the vagus complex are disposed as follows, one for each of the four branchial nerves, and one for the intestinal nerve.

In this preliminary communication the segmental value of the various cranial nerves is not considered, but it is pointed out that further investigations may show that the ganglia in connection with the superficial ophthalmic buccal palatine and hyomandibular nerves are related to the geniculate, otic, sphenopalatine, and sub-maxillary ganglia of the higher Vertebrata.

Physical Society, March 9.—Prof. Reinold, President, in the chair.—Prof. O. J. Lodge read a paper on magneto-optic rotation by transient currents, with reference to the time required for the production of the effect. If a piece of heavy glass, or tube of carbon bisulphide, be placed between two crossed Nicols, and surrounded by a solenoid, light passes through when a Leyden jar is discharged through the wire. That the discharge is oscillatory, may be proved by turning the analyzer slightly to one side or the other, this having no effect on the result; or the beam may be examined by a revolving mirror, in which case a beaded band is seen when the discharge takes place. When the spark itself is analyzed in the same way, a serrated band results. The frequency of the oscillations being given by the formula—

$$n = \frac{1}{2\pi \sqrt{\frac{L}{\mu K}}}$$

it is evident that n will be decreased by increasing the capacity S and self-induction L , and this fact was demonstrated by connecting two condensers, first in series and then in parallel, and placing coils of wire in the circuit. The pitch of the sound emitted by the spark was by these means brought within the musical scale. Contrary to expectation, the insertion of a coil with an iron core produced little or no change in the pitch, the reason given being that the induced currents in the skin of the iron wire due to such rapid oscillations of current prevent the interior being magnetized. From the mathematical theory of the brightening of the dark field, it appears that the relative brightness, B , when compared with the light field obtained from the uncrossed Nicols, is given by—

$$B = \frac{1}{\tau} \int_0^\tau \sin^2 \theta dt,$$

where τ is the time during which an impression can be accumulated on the retina, and θ the angle through which the polarized beam is rotated. When θ is considered small,

$$B = 16\pi^2 k^2 n^2 \frac{1}{2} \frac{SV_0^2}{R\tau},$$

where k = Verdet's constant, n = number of convolutions on the solenoid, R = resistance of circuit, and $\frac{1}{2}SV_0^2$ = the initial energy of the static charge. The general solution is given as—

$$B = \frac{1}{2\pi\tau} \int_0^A \frac{1 - J_0(x)}{x} dx,$$

where $m = \frac{R}{2L}$, $A = 8\pi kn\mu V_0 \sqrt{\frac{S}{L}}$, and $J_0(x)$ Bessel function.

Taking the approximate solution, the question as to what is the best size of wire wherewith to wind the solenoid is considered, and as the insulation is very important, it is concluded that the secondary of a Ruhmkorff coil is very suitable. The main interest of the experiment is said to lie in the evidence afforded of the practical instantaneity of the development of the rotary property in the substance under examination, for Villari (from experiments made on a glass drum revolving in a magnetic field) inferred that a distinct time, between 1/800 and 1/400 of a second, was necessary, whereas Profs. Bichat and Blondlot, of Nancy, have concluded that the time required is less than 1/30000 of a second. The author finds that carbon bisulphide is able to show the effect when the rate of alternation is 70,000 per second, and has no reason to believe that glass is in any way inferior. As a possible explanation of Villari's results, he suggests that the strain due to centrifugal force would modify the components of the polarized beam, and produce elliptic polarization. Mr. Ward mentioned that experiments similar to Villari's were now being carried out at the Cavendish Laboratory, a disk of glass being rotated about two hundred times per second by means of a turbine. The results so far obtained do not confirm Villari's, but, owing to difficulties in keeping the speed constant, it is difficult to make exact measurements. It has, however, been found that the strain due to centrifugal force rotates the plane of polarization, and elliptically polarizes the beam; and that passing an alternate current round a stationary glass bar produces a distinct rotation of polarized light passing through it. Referring to the oscillatory discharge of a jar, Prof. Rücker directed attention to Dr. E. Cook's experiments, described before the Society in June 1888, when photographs showing the dust-figures produced by sparks were exhibited, and pointed out that the frequency required to produce air-waves of the length there indicated was of the same order as the rate of oscillatory discharge—viz, about one million per second. Prof. Rücker also wished to know whether glass behaved precisely like CS_2 . Dr. Lodge said his experiments were not exact enough to decide the latter question, and mentioned that Mr. Chattock had, some time ago, produced dust-figures in tubes by jar-discharges, and shown that the wave-length depended on the capacity and self-induction. Prof. Ayrton suggested the use of a phonograph as a means of recording and reproducing the oscillations, in the same way as himself and Prof. Perry have analyzed the current-curves of alternating dynamos. The discharge could be passed through a small coil fixed to a diaphragm, and placed near a coil through which a steady current was passing, the attractions and repulsions serrating the surface of the rapidly revolving cylinder. By means of a mirror attached to a delicate magnifying spring, the section of the surface may be determined. He also inquired whether the experiments shown do prove that the effect is instantaneous. Dr. Thompson remarked that it was satisfactory to learn that Villari's results admit of an interpretation other than by time effect, and thought it advisable to vary the experiment by rotating a bar of glass; but Mr. Ward said he attempted that experiment four years ago, and abandoned it on account of the enormous speed required.—Dr. Lodge showed some experiments allied to those of Hertz, and pointed out that all the effects were due to resonance. The plates of an air-condenser were connected by a wire loop, and placed near a Holtz machine in action. On adjusting the distance between the plates to a particular value, sparks were observed to pass between them; but, on increasing or decreasing that distance, the sparks ceased. It was also shown that the sparking was interrupted if the connecting loop was replaced by a coil, though the coil was effective when connected to a condenser of smaller size, thus demonstrating that the time-constant of the condenser circuit was all-important. Another important condition to be observed in such experiments is, that the receiving circuit must be closed, except at the sparking place, so as to permit the surges of the electricity to take place freely. Other experiments were shown, in which two spheres provided with rods terminating in knobs were used as a Hertz's oscillator, and sparks could be obtained from straight pieces of wire of

suitable length held at some distance from the spheres. Dr. Lodge remarked that sparks could be obtained from almost any scrap of wire or metal in close proximity to an induction-coil and oscillator; but, to produce the effects at considerable distances, careful timing of the receiving circuit was necessary. The author also mentioned the results of some experiments on the velocity with which electric waves travel along wires, and concluded (contrary to Hertz) that this was not greatly different from the velocity of light.—Owing to the late hour, the other papers announced to be read were postponed.

Entomological Society, March 6.—The Right Hon. Lord Walsingham, F.R.S., President, in the chair.—Mr. F. P. Pascoe exhibited several specimens of the Sailba Ant (*Ecodoma cephalotes*) from Pará, carrying portions of dried leaves. It seemed questionable whether the leaves were collected by the ants for the purpose of making their nests, or for the sake of some Fungus which might be growing on them.—Mr. Jenner-Weir exhibited, and read notes on, specimens of a Butterfly (*Tirumala petiverana*) from Mombaza, Eastern Africa.—Mr. J. H. Durrant exhibited a living larva of *Cossus ligniperda*, which had entirely lost its ordinary colour, and had become first pink and then white. He attributed the change, and subsequent loss, of colour to the fact that it had been deprived of its natural food, and fed for eighteen months on pink paper, with which the box in which it was kept was lined, and subsequently on white cardboard. Mr. McLachlan remarked that the most extraordinary peculiarity about this larva, in addition to the loss of colour, was the absence of the usual odour of *Cossus*. Lord Walsingham observed that it was questionable whether the colours of larvæ were dependent on the colours of their surroundings, or whether they were affected by the contents of the intestinal canal. Prof. Meldola, F.R.S., said that the caterpillar exhibited, having eaten the pink paper, had most probably become dyed by the colouring-matter, and he did not think the observation had much bearing on the question of the protective colouring of caterpillars. It was well known to physiologists that certain dye-stuffs could be introduced into the tissues of animals by mixing the colouring-matters with the food, and paper was frequently stained with coal-tar dyes, such as eosin, magenta, &c., so that it was simply a case of direct dyeing of the larva.—Mr. B. A. Bower exhibited a specimen of *Parasia neuropterella*, bred from heads of *Centaurea scabiosa*, and said he believed the species had not been previously bred. He also exhibited series of *Coleophora olivaceella*, *C. solitariaella*, and *Laverna subbistrigella*.—Mr. White exhibited a series of male and female specimens of *Orygia thyalina*, obtained by the late Mr. H. J. Pryer in Japan. Some of the females had their wings fully developed, and some of them were semi-apterous, as is usual with the females of this genus. Mr. White remarked that he knew of no other species of the genus in which the females had fully-developed wings. Lord Walsingham, Prof. Meldola, and Mr. R. South took part in the discussion which ensued.—Lord Walsingham exhibited specimens of preserved larvæ of *Eupithecia extensaria*, from King's Lynn; also a preserved larva of *Smerinthus ocellatus* and one of *Sphinx ligustri*. The larva of the last-named species was a variety, and the President remarked that it was the only one of this species he had ever seen.—The Secretary read a communication from the Rev. Dr. Walker, announcing his intention of making an expedition to Iceland this year, from June 23 to July 29, and asking that any entomologists who might wish to accompany him would send him their names.—Mr. Distant suggested that the meeting should pass a resolution expressing regret at the death of the Rev. J. G. Wood.—Mr. Gervase F. Mathew, R.N., communicated a paper entitled "Descriptions and Life-histories of New Species of Rhopalocera from the Western Pacific."

Zoological Society, March 5.—Prof. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of February 1889, and called attention to four Marbled Polecats (*Putorius sarmaticus*), presented by Colonel Sir Oliver B. C. St. John, new to the collection; and to a fine specimen of Owen's Apteryx (*Apteryx oweni*) from the South Island of New Zealand, presented by Prof. T. Jeffrey Parker. Mr. A. Thomson exhibited a series of insects reared in the Insect House in the Society's Gardens during the past year, and read a report on the subject.—Prof. G. B. Howes exhibited and made remarks on some specimens of the embryo of *Myrmecobius fasciatus*.—Mr. O. Thomas exhibited a specimen of a

new Muntjac from Tenasserim, lately discovered by M. Fea, and proposed to be called *Cervulus fea*.—A communication was read from Mr. Joseph S. Baly, containing descriptions of some new South American Coleoptera of the genus *Diabrotica*.—A communication was read from the Rev. H. S. Gorham, containing descriptions of some new species and a new genus of the Coleopterous family Telephoridae, from Eastern Asia. Thirty-nine new species and one new genus (for which the name *Lycocerus* was proposed) were described. Of these new forms, the greater part were from India and China.—Colonel R. H. Beddome read a paper on new land-shells from the Island of Koror (Pelew Group), based on specimens collected for Dr. Hungerford by a resident in that island. The series comprised examples of eight new species of the genus *Diplommatina*, of two new and very curious species of *Endodonta* (a section of *Helix*), and of a remarkable new genus, allied to *Diplommatina*, proposed to be called *Hungerfordia*.—Mr. W. E. Hoyle read a paper on the anatomy of a rare Cephalopod (*Gonatus fabricii*), originally discovered by Fabricius in the last century, but little known in recent times. The author gave a general description of the anatomy of the species, and recorded the existence of several tracts of cartilage hitherto unobserved in the Cephalopoda. Some details were given regarding the structure of the pen-sac and the development of the pen, as well as some new facts regarding the structure of the funnel-organ, and a suggestion regarding its function. The genus was regarded as being somewhat more nearly related to *Onychoteuthis* than to *Enoplateuthis*, but as much further removed from them both than they are from each other. The creation of the sub-family Gonatidae was thus held to be justified.

Mathematical Society, March 14.—Mr. J. J. Walker, F.R.S., President, in the chair.—The following papers were read:—Notes on plane curves: iv., involution-condition of a cubic and its hessian; v., figure of a certain cubic and its hessian, by the President (Mr. E. B. Elliott in the chair).—The problem of duration of play, by Major MacMahon, R.A.—Some results in the elementary theory of numbers, by Mr. C. Leudesdorf.—The characteristics of an asymmetric optical instrument, by Dr. J. Larmor.—A new angular and trigonometrical notation, with applications, by Mr. H. MacColl.

EDINBURGH.

Royal Society, March 4.—Sir W. Thomson, President, in the chair.—A paper, by Dr. J. Oliver, on deductive evidence of a uterine nerve-centre and of its location in the medulla oblongata, was communicated.—The President exhibited a gyrostatic model of a medium capable of transmitting waves of transverse vibration. The model was two-dimensional, but a three-dimensional model could readily be constructed on the same principle.—Dr. Thomas Muir read a paper on the relation between the mutual distances of five points in space. He has reduced Cayley's determinant to one of the fourth order.—Dr. Muir also communicated a note, by Prof. Tait, on the relation among four vectors. In this note Prof. Tait gave an investigation of the same problem by means of quaternions. His result can be interpreted in two ways; one interpretation leads to Dr. Muir's result, while the other gives the well-known relation among the sides and diagonals of a spherical quadrilateral.—Dr. Muir exhibited a diagram illustrating the history of determinants.—Dr. Noel Paton and Dr. Ralph Stockman communicated a paper on the metabolism of man during starvation.

March 18.—Dr. John Murray, Vice-President, in the chair.—Prof. Haycraft read a contribution, written by Dr. Harold Scofield and himself, to the chromatology of the bile.—A paper by Prof. Tait on a relation between two groups of four vectors was read. When the two groups are identical, the result reduces to that obtained by him in his paper read at last meeting. When one spherical quadrilateral is the polar of the other, the relation reduces to $\cos Ab \cos Bc \cos Cd \cos Da = \cos Ac \cos Bd \cos Ca \cos Db$. Cayley's determinant can at once be obtained from the identity $\Sigma x(a - \theta)^2 = \Sigma xa^2 - 2S\theta \Sigma(xa) + \theta^2 \Sigma(x)$, where there are five vectors $a_1 \dots a_5$, and $\Sigma(x) = 0$, $\Sigma(xa) = 0$, by replacing θ by the various vectors a in turn and eliminating the x 's from the resulting equations by aid of the equation $\Sigma(a) = 0$.—A paper by Mr. John Aitken, describing a portable apparatus for counting the dust particles in the atmosphere, was read. This apparatus is constructed on the same principle as his former one, but various improvements have been made. The paper also included an account of some of Mr. Aitken's observations with the large apparatus. It is pointed out that when much dust is pre-

sent in the atmosphere the heat of the sun is greatly absorbed. Hence it seems probable that dust particles may aid in the formation of fogs in another way than by acting as nuclei. Their great radiating power will cause rapid cooling of the air, and so produce saturation.—Dr. Sims Woodhead communicated a paper, by Mr. R. W. Gray and himself, on the stomach of the narwhal.—Dr. Crum-Brown read the third part of a paper, by Dr. A. B. Griffiths, on micro-organisms.—A second note by Prof. Tait, on the virial equation, was read.

PARIS.

Academy of Sciences, March 18.—M. Des Cloizeaux, President, in the chair.—On the fixation of nitrogen during the process of slow oxidation, by M. Berthelot. The object of these researches is to determine the fixation of nitrogen during the slow oxidation especially of those principles that give rise to certain intermediate oxides endowed with mixed oxidizing and oxidizable properties which temporarily fix free oxygen, afterwards transforming it to an almost indefinite extent to other bodies capable of definite oxidation. Such are ordinary ether, the essence of terebenthine, various aromatic hydrocarbons, and other substances capable of producing those effects which their discoverer, Schoenbein, attributed to ozone.—On the heat of formation of antimoniuiretted hydrogen, by MM. Berthelot and P. Petit. The formation of this extremely unstable compound is described, and its heat of formation determined by six experiments at -84.5 calories.—On the essays that have been made to explain the fundamental principles of thermodynamics by mechanical laws, by M. H. Poincaré. The paper deals mainly with the views developed by Helmholtz in his memoirs on the statics of the monocyclic systems, and on the principle of least resistance (*Crelle's Journal*, vols. xcvii. and c.). M. Poincaré accepts the mechanical explanation as satisfactory for the reversible phenomena, but shows that it is not applicable to those of the irreversible order.—On certain fourfold periodical expressions depending on two variables, by M. E. Picard. In this note the author indicates certain series depending on two independent complex variables, and possessing in relation to them four couples of conjugated periods.—On the movement of a material point on a sphere, by M. Gustave Kobb. In his treatise on some applications of the elliptical functions, M. Hermite has reduced the integration of the equations in the movement of the conic pendulum to the integration of Lamé's differential equation. Here M. Kobb shows that there also exists another kind of movement of a material point on a sphere which leads to a similar application of Lamé's equation.—On the elastic equilibrium of arches forming arcs of circles, by M. Ribière. Two typical cases are worked out mathematically, which offer a complete solution of the problem of the elastic equilibrium of circular vaults.—On the solubility of salts, by M. H. Le Chatelier. The author replies to some critiques on his own researches (*Comptes rendus*, vol. c. p. 50), made by M. Bakhuis Roozeboom, in the remarkable work recently published by him on the solubility of salts.—On the chloride and bromide of copper, by M. Denigès. The author describes a simple process for preparing these substances by means of the haloid salts of the alkalies and the sulphate of copper. The same chemist indicates a new and characteristic reaction of the salts of copper, the principle of which rests on the easy transformation of these salts into cupric bromide under the influence of potassium bromide, and on the dehydration of the resulting salt by means of sulphuric acid.—Researches on the saccharine substances contained in certain species of mushroom, by M. Em. Bourquelot. These researches have been made on eight species belonging to the genus *Lactarius* of Fries, and to Sowerby's *Boletus aurantiacus*. The proportion of mannite was found to vary from 1.90 to 15 per cent., according to the different species, and sometimes in the same species from season to season. From *Lactarius piperatus* a substance was obtained identical with M. Berthelot's trehalose, the presence of which in mushrooms had already been indicated by M. Müntz.—On the physiological and therapeutic action of orthomethylacetanilide, by MM. Dujardin-Beaumetz and G. Bardet. This substance, which has recently been prepared by M. Brignonnet under the name of exalgine, with formula $C_9H_{11}NO$, is toxic, therapeutic, and anæsthetic, according to the dose administered. In these respects it greatly resembles antipyrine, but appears to be superior as a cure for all forms of neuralgia.—Thermic classification of fresh-water lakes, by M. F. A. Forel. Lacustrine basins are here grouped as tropical, temperate, and polar, according as the surface waters are

always above, about, or under 4° C. respectively. But with this grouping is combined the variation of temperature due to depth, this variation increasing with the shallowness of the lake. Further modifications are caused by special climatic conditions, such as altitude, latitude, aspect, volume, so that from the thermic stand-point every fresh-water basin has its special features. All are comprised in six broad classes, based, however, mainly on the two more important elements of surface temperature and depth.

BERLIN.

Physical Society, February 22.—Prof. von Helmholtz, President, in the chair.—Prof. Neesen demonstrated several pieces of mechanical apparatus which he is in the habit of using in his lectures to illustrate and explain the parallelogram of forces, the laws of inertia, and the action of friction with special reference to the slipping of locomotives. He further described several arrangements connected with mercurial air-pumps by which some of their defects and inconveniences may be avoided.—Dr. Wolff gave an account of the results of a long series of measurements which he had made on galvanic cells, consisting of zinc and zinc sulphate or chloride and a second metal, either copper, silver, or iron. By determining the electromotive force of each cell and the simultaneous heat-production (by means of an ether calorimeter), he endeavoured to prove that the source of the current-energy in each case is due to the combining of oxygen with the several metals, copper, silver, or iron. He hence considered himself justified in giving the name "oxygen-elements" to the above class of galvanic cells.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Chemical Lecture Notes: P. T. Austen (Wiley, New York).—The Scientific Transactions of the Royal Dublin Society. vol. iv. (series 2), ii. A Monograph of the Marine and Fresh-water Ostracoda of the North Atlantic and of North-Western Europe; Section I., Podocopa: G. A. Brady and Rev. A. M. Norman; iii. Observations of the Planet Jupiter: O. Boedicker; iv. A New Determination of the Latitude of Dunsink Observatory: A. A. Rambaut (Williams and Norgate).—The Patents, Designs, and Trade Marks Acts, 1883-88, consolidated, with an Index: L. Edmunds (Stevens).—Longmans' New Atlas: edited by G. G. Chisholm (Longmans).—British Dogs, Nos. 27, 28, 29: H. Dalziel (U. Gill).—Travel-Tide: W. St. Clair Baddeley (Low).—Naturalistic Photography: P. H. Emerson (Low).—Stellar Evolution and its Relations to Geological Time: J. Croll (Stanford).—Naturalist's Voyage round the World: C. Darwin (Murray, 3s. 6d.).—Northern Afghanistan: Major C. E. Yate (Blackwood).—Modern Cremation: Sir Henry Thompson (K. Paul).—Cosmic Evolution: E. A. Ridsdale (Lewis).—Physical Geography and the Climate of New England: W. M. Davis (Camb., Mass.).—Proceedings of the Academy of Natural Sciences of Philadelphia, October-December 1888 (Philadelphia).

CONTENTS.

	PAGE
The New Traveller's Guide to Scientific Inquiry . . .	505
Plant Life	507
Practical Electrical Measurements	508
Our Book Shelf:—	
Wegg-Prosser: "Galileo and his Judges"	509
Bruce: "Observations on the Embryology of Insects and Arachnids"	509
Letters to the Editor:—	
The Satellite of Procyon.—J. M. Barr	510
"Les Tremblements de Terre."—F. Fouque	510
Finding Factors.—Prof. W. H. H. Hudson	510
<i>Dolomedes fimbriatus</i> , Clerck, at Killarney.—A. G. More	511
Beech-wood. By Prof. H. Marshall Ward, F.R.S.	511
Spectroscopic Researches at the Norwegian Polar Station	515
Notes	516
Our Astronomical Column:—	
Observations of Jupiter	519
Astronomical Phenomena for the Week 1889	
March 31—April 6	519
Geographical Notes	519
Electrical Notes	520
On the Confluences and Bifurcations of Certain Theories. By Sir James Cockle, F.R.S.	521
Exhibition of Meteorological Instruments. By William Marriott	523
University and Educational Intelligence	525
Scientific Serials	525
Societies and Academies	526
Books, Pamphlets, and Serials Received	528